NAAQS Update - Monitoring

Nealson Watkins
US EPA – OAR – OAQPS
Ambient Air Monitoring Group

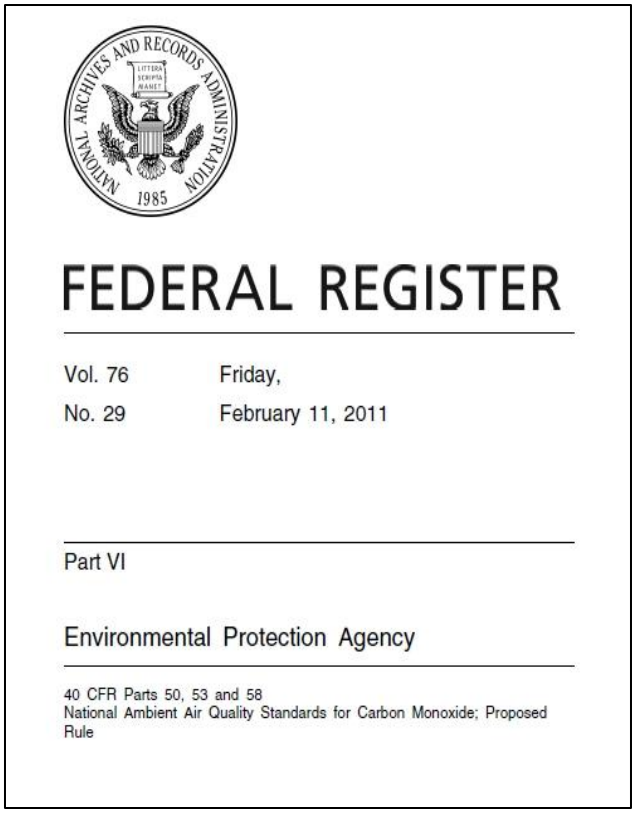
NAQC – March 2011

NAAQS Update – Monitoring Implications

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Sulfur Dioxide (SO_2)
- Lead (Pb)
- Ozone (O_3)
- Secondary NO_X/SO_X

CO – Notice of Proposed Rulemaking

- Proposal signed January 28th, 2011
- Published in the Federal Register on February 11th, 2011 (http://www.epa.gov/ttn/naaqs/standards/co/s_co_cr_fr.html)
- Public comment period closes April 12th, 2011
- NAAQS proposed to be retained, however, EPA proposed minimum monitoring requirements for CO monitors near heavily trafficked roads and revised siting criteria
- Federal Reference language was updated
  - EPA did not require the use of trace-level instruments



FEDERAL REGISTER

Vol. 76 Friday,
No. 29 February 11, 2011

Part VI

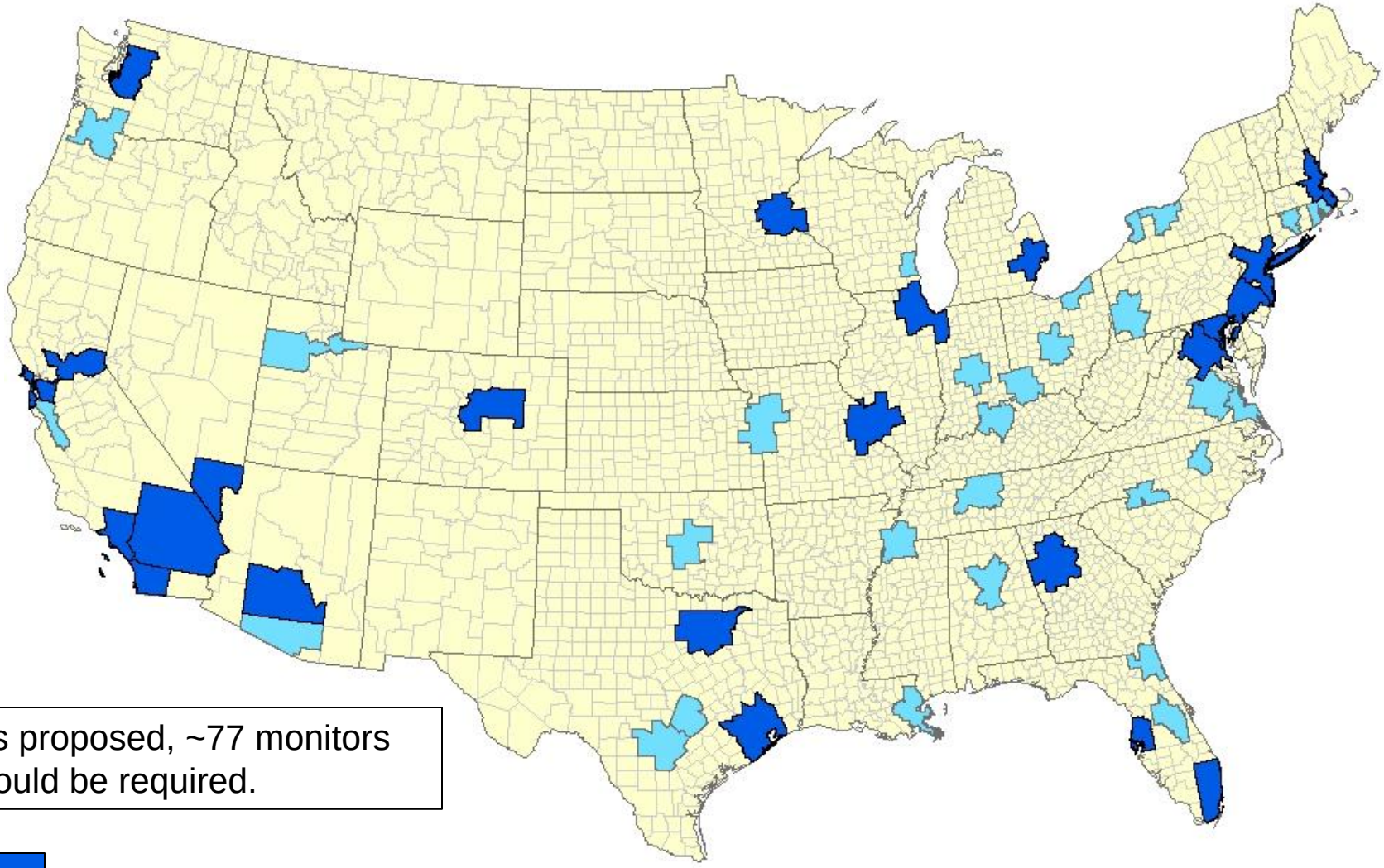
Environmental Protection Agency

40 CFR Parts 50, 53 and 58
National Ambient Air Quality Standards for Carbon Monoxide; Proposed Rule

CO – Proposed Monitoring Requirements

- Proposal calls for CO monitors to be co-located with any required near-road NO_2 monitor in any Core Based Statistical Area (CBSA) with 1 million or more persons.
- Would require approximately 77 monitors within 53 CBSAs
- Annual monitoring plans proposed to be due July 2012 (matches NO_2)
- Network proposed to be operational January 1, 2013 (matches NO_2)
- Regional Administrators are proposed to have authority to require additional monitors on case-by-case basis (working with States)

Proposed Carbon Monoxide Monitoring Revisions Would Place Monitors Near Major Roads in Large Urban Areas



As proposed, ~77 monitors would be required.

24 urban areas would need 2 monitors

29 urban areas would need 1 monitor

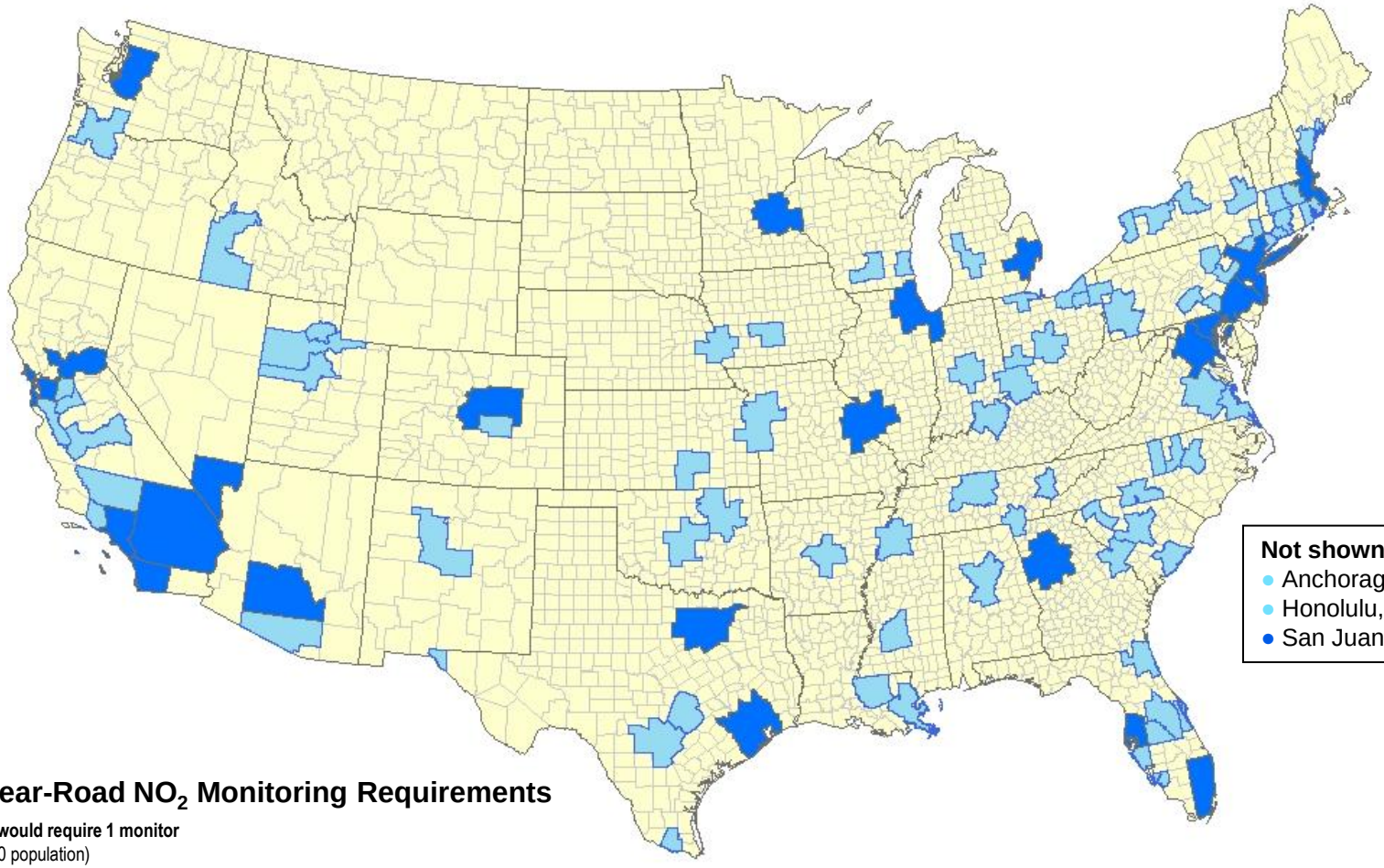
San Juan, PR (not shown) is proposed to have two required monitors.

NO_2 Monitoring Requirements

- EPA finalized a network design to assess peak, short-term NO_2 concentrations, particularly those that occur near heavily trafficked roads, community-wide NO_2 concentrations, and ambient exposures in low income or minority at-risk communities
  - **Near Road (~127 monitors in 103 CBSAs)**
    - At least one monitor would be located near a major road in any urban area with a population greater than or equal to 500,000 people.
    - A second monitor would be required near a major road in areas with either:
      - population greater than or equal to 2.5 million people, or
      - one or more road segments with an annual average daily traffic count greater than or equal to 250,000 vehicles
  - **Area (or Community)-Wide (~53 monitors)**
    - A minimum of one monitor would be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations
  - **Susceptible and Vulnerable Communities (40 monitors)**
    - Working with the states, EPA Regional Administrators will site at least 40 additional NO_2 monitors to help protect communities that are susceptible and vulnerable to NO_2 -related health effects
- State and local air agencies are to account for required NO_2 monitoring in their annual monitoring plan due July 2012.
- The required NO_2 network is to be fully operational by January 1, 2013.

EPA United States Environmental Protection Agency

Near Road NO_2 Monitors Are Required in 103 Urban Areas



Not shown on map
- Anchorage, Alaska
- Honolulu, Hawaii
- San Juan, Puerto Rico

Minimum Near-Road NO_2 Monitoring Requirements

79 areas would require 1 monitor
(≥ 500,000 population)

24 areas would require 2 monitors
(≥ 2.5 million population or road segments with annual average daily traffic counts ≥ 250,000 vehicles)

127 total monitors

Near-road Implementation Efforts

- EPA is drafting a Technical Assistance Document to assist in the implementation of required near-road NO_2 sites
  - First public draft due May/June 2011
    - Will undergo CASAC – Ambient Air Monitoring and Methods Subcommittee review
  - Final document expected in Fall of 2011

- A group of volunteer State and local agencies are participating in a near-road pilot study
  - Broward County, FL (Miami CBSA)
  - City of Albuquerque (Albuquerque CBSA)
  - Hillsborough County, FL (Tampa CBSA)
  - Idaho (Boise CBSA)
  - Maryland (Baltimore CBSA)

- State and local experiences are expected to be shared to benefit the air monitoring community regarding implementation issues

SO_2 - Hybrid Monitoring/Modeling Approach

- EPA plans to use a combination of monitoring and modeling to assess compliance with the 1-hour standard
  - More technically appropriate and efficient to model medium to larger sources and to rely on monitoring for groups of smaller sources and sources not as conducive to modeling.

- Basis for revising monitoring-focused proposal to hybrid approach that includes modeling:
  - Address comments that increasing monitoring was insufficient and too burdensome, and
  - Consistent with historic approach to SO_2 compliance that used both monitoring and modeling to make determinations.

Hybrid Monitoring/Modeling Approach to Assess Compliance with the New Standard (cont.)

- For sources or groups of sources that have the potential to cause or contribute to a violation of the standard, EPA anticipates using refined source-oriented dispersion modeling to:
  - identify violations, and
  - determine compliance.

- EPA plans to develop modeling and implementation guidance for the states addressing a variety of issues including how to:
  - Appropriately compare the model results to the new SO_2 standard, and
  - Identify and appropriately assess the air quality impacts of smaller SO_2 sources that may potentially cause or contribute to a violation of the new SO_2 standard.

- EPA will provide an opportunity for public comment on the guidance before issuing it in final form.

SO_2 - Monitoring Network Requirements

- The final monitoring regulations require monitors to be placed in Core Based Statistical Areas (CBSAs) based on a population weighted emissions index for the area . The final rule requires:
  - 3 monitors in CBSAs with index values of 1 million or more;
  - 2 monitors in CBSAs with index values less than 1 million but greater than 100,000; and
  - 1 monitor in CBSAs with index values greater than 5,000.

- An estimated **163** SO_2 monitoring sites nationwide are required by this rulemaking (based on 2005 NEI & 2008 Census estimates).

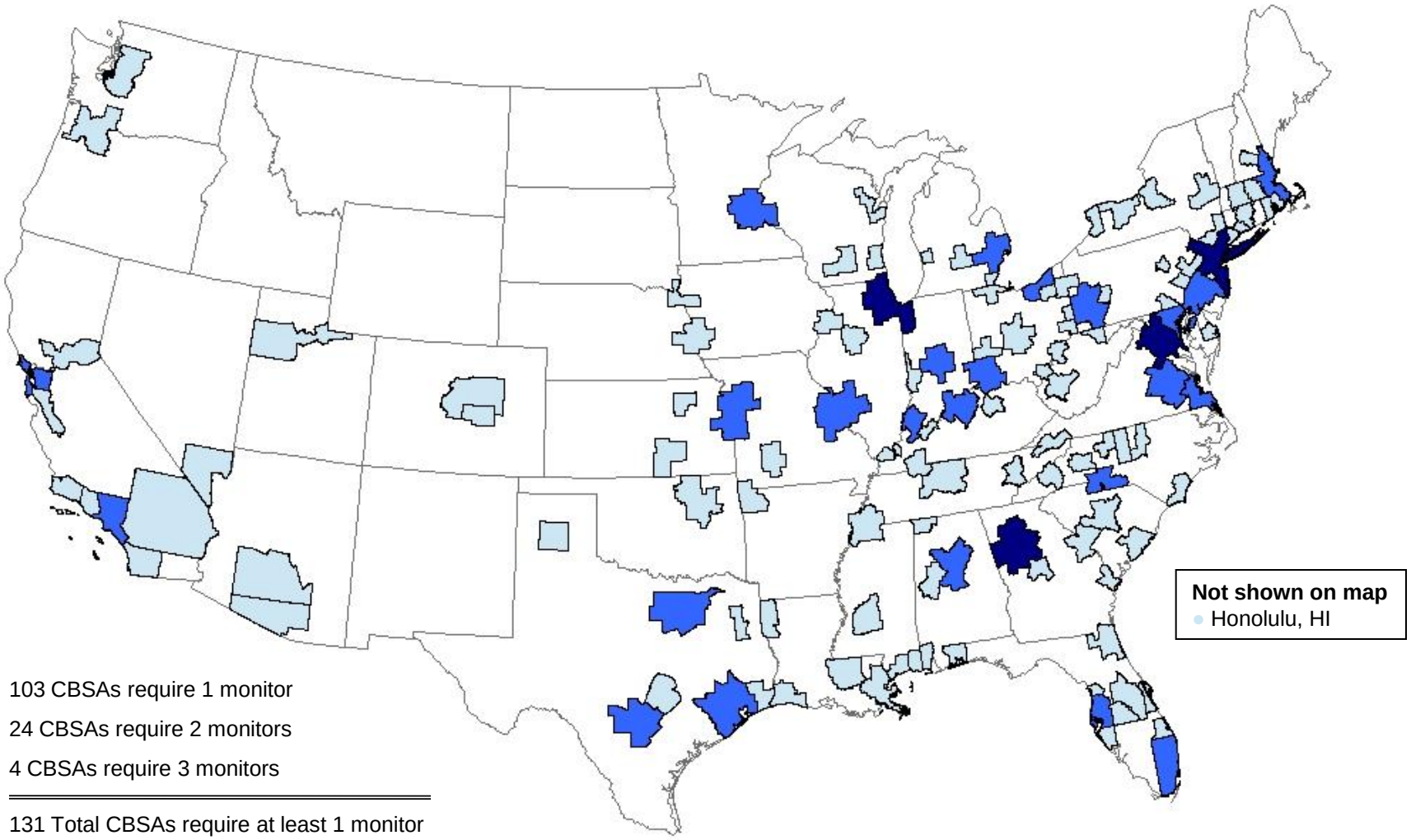
- EPA Regional Administrators have the authority to require additional monitoring in certain circumstances.

- Annual network plans need to reflect state intentions for required SO_2 monitors (based on current estimates) in July of 2011.

- All required SO_2 monitors must be operational by January 1, 2013.

➢ Updated the population weighted emission index values can be calculated upon release of 2008 NEI and 2010 Census data.

Monitoring Requirements for the Revised Primary 1-Hour Sulfur Dioxide (SO_2) Standard



Notes:

1. The number of monitors for each CBSA is based on a population-weighted emissions index.
2. The estimates of required monitors use emissions data from the 2005 National Emissions Inventory and population data from a 2008 Census estimate.

Pb - Monitor Deployment Schedule

- Monitoring requirements were finalized December 27, 2010
  - Revised from October 2008 rulemaking
- Three monitoring components:
  - Source oriented
  - Airport specific
  - Non-source oriented
- Final rule requires monitoring agencies to submit revised Pb monitoring plans by July 1, 2011 as part of Annual Monitoring Plan submittal
- Final rule requires all new required monitors (source and non-source) be operational by December 27, 2011
  - Based on sampling calendar, the first sample would be required to be collected on December 29, 2011

Pb (Lead) - Source Oriented Monitoring

- Final requirement sets emission threshold at 0.50 tpy as proposed (except for airports)
  - Consistent with supporting analyses
  - Will improve our ability to identify areas exceeding NAAQS
- Monitoring agencies are allowed to request a modeling based waiver if they can demonstrate maximum Pb concentration less than 50% of the NAAQS on rolling 3-month average.
  - Waivers are not needed if monitoring agencies can demonstrate (to RA satisfaction) that emissions are less than 0.50 tpy.
- If monitoring agencies had previously obtained a waiver for a 1.0 tpy source, a new waiver is not required

Pb - Monitoring at Airports

- Final requirement maintained emission threshold for airports at 1.0 tpy

- Rule also requires 1-year of Pb monitoring at 15 specific airports where concentrations may approach or exceed the Pb NAAQS
  - Airports were selected based on three criteria which lead to higher ambient Pb concentrations
    - Pb emissions >= 0.50 tpy
    - Ambient air within 150 meters of runway end or ramp-up area
    - Meteorology and airport layout that leads to majority of take-offs from one runway end
  - Pb-TSP is required to assure comparability to the NAAQS
  - No waivers will be allowed for these 15 airports
  - Monitors become “permanent” if any 3-month rolling average is equal to or exceeds 50% of the NAAQS
  - OAQPS is working with Regions to distribute funding for the airport study as well as newly required source monitors

Pb - Non-Source-Oriented Monitoring

- Final rule requires Pb monitoring at NCore sites in CBSA with a population of 500,000 people or more
  - Replaces requirement to monitor in each CBSA with a population of 500,000 people or more to evaluate non-inventoried Pb sources
    - Preamble and rule provides guidance identifying fugitive Pb sources which may require monitoring
    - Rule revises RA authority slightly to clarify that it applies to re-entrained dust sources
  - Changed collocation requirement for Pb at NCore to be based on the entire NCore network rather than per PQAO
  - Pb-PM_{10} is allowed (and expected) at NCore
  - Leverage with $PM_{10-2.5}$ is possible if using low-volume PM_{10}
  - Expectation is that most NCore sites will already have an appropriate sampler available

O_3 - Status of Ozone Monitoring Rule

- Ozone monitoring proposal published July 16, 2009
  - Comments received from Department of Interior, 17 states, multi-state organizations (NACAA, MARC, WESTAR), tribes, citizens.
- EPA is considering relationship of monitoring revisions to the status of the O_3 NAAQS reconsideration process that is underway
- Potential timeline for implementation of any new ozone monitoring requirements could be:
  - Revised ozone seasons effective in 2012 or 2013
  - Additional ozone monitors (if any) staggered in 2013 and 2014 and perhaps later
- Additional information on rule timing will be communicated as it becomes available

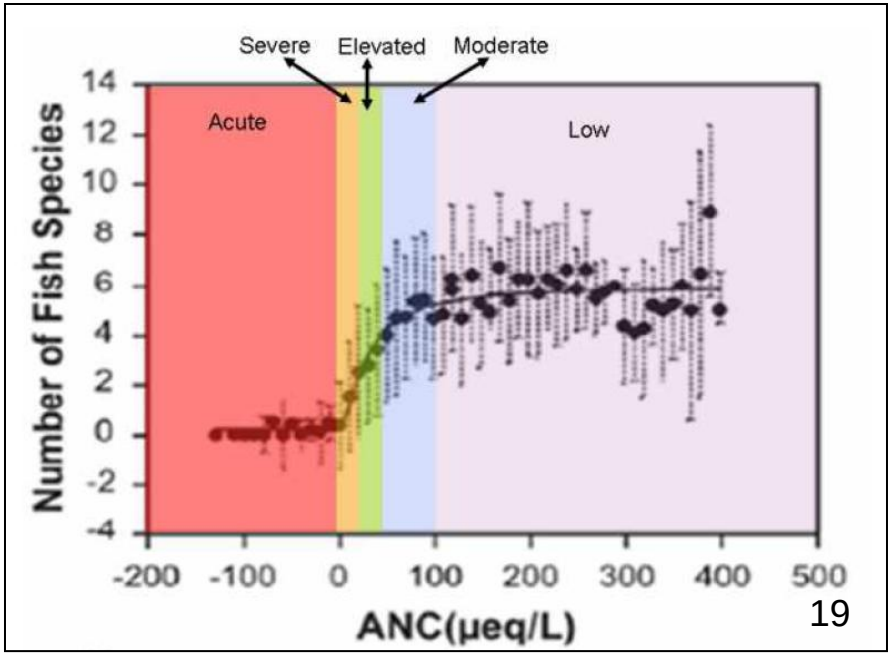
Secondary NO_X/SO_X NAAQS

An Overview

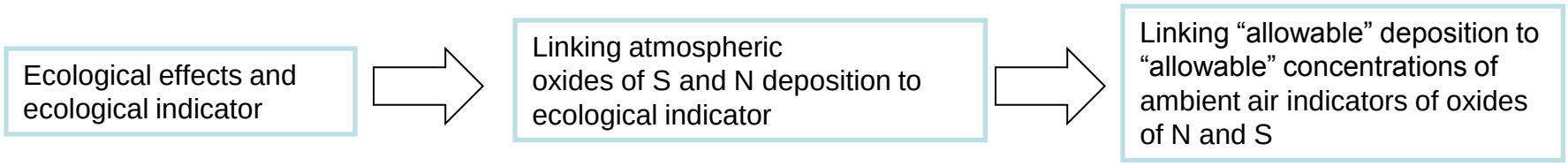
Secondary NO_X/SO_X NAAQS

- Court ordered proposal due July 12, 2011
  - No decisions have been made at this time.
- Court ordered final rule due March 20, 2011
- Staff Policy Assessment Released February 2011
- The approach: Protect against aquatic acidification
- Acid Neutralizing Capacity or (ANC)

  A well-accepted and widely used measure of the capacity of an ecosystem to protect against acidifying deposition
  - Highly associated with effects of concern, including fish mortality and reduced aquatic species diversity
  - Clear relationship between N + S deposition and ANC



Concept of the Aquatic Acidification Standard



POTENTIAL Elements of the standard:

- **Indicators**: NOy and SOx to be measured by States to determine if the standard is met
- **Form**: Aquatic Acidification Index (AAI) equation
  - Ambient air concentrations are input to the equation
  - Equation parameters are calculated from well-accepted critical loads models and CMAQ modeled deposition velocities.
  - Equation parameters vary spatially across the U.S., so that "allowable" NOy and SOx concentrations also vary across the U.S. (to account for ecosystems variation in sensitivity to NOy and SOx) while affording all ecosystems the same amount of protection
- **Level**: the target AAI value that, in combination with the other elements of the standard, is judged to provide requisite protection
- **Averaging time**: TBD, however long term averaging will be appropriate (e.g., yearly or longer)

NO_X/SO_X - **POTENTIAL** Indicators of the Standard

- Attributes & Considerations
  - Association: does the ambient indicator reflect acidification potential?
  - Can we effectively and consistently measure it?

- Oxides of Nitrogen (NO_X)
  - NOy, defined as the sum of all reactive oxidized nitrogen species (e.g., NO_2, NO, HNO_3, p-NO_3,PAN,….)
  - NOy is a measurement that captures all species, but not information on the contribution of each separate species to the total
  - Particle-bound nitrate can be measured via integrated filter measurements

- Oxides of Sulfur (SO_X)
  - SOx, defined as the sum of:
    - sulfur dioxide gas, SO_2, and particulate sulfate, SO_4
    - SO_2 and SO_4 are measured separately

- Consideration of Methods
  - Integrated methods exist for SO_2, Sulfate, and Nitrate
  - Continuous methods exist for SO_2 and NOy

NO_X/SO_X - **POTENTIAL** Form of the Standard

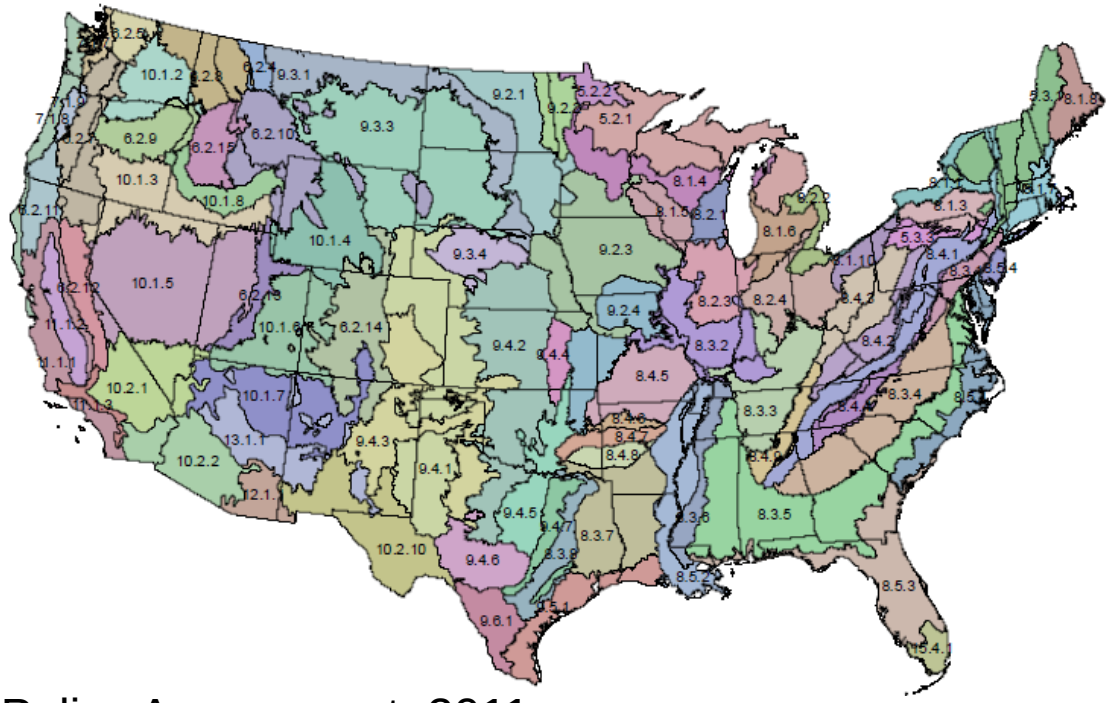
$$\text{Aquatic Acidification Index AAI} = F_1 - F_2 - F_3\,[\text{NOy}] - F_4\,[\text{SOx}]$$

- Attributes
  - Association:
    - Links ecologically relevant effects to ambient air indicators through deposition
  - Consider,
    - Does the AAI respond reasonably to changes associated with air management practice (e.g., emission changes) over time?
    - Need to define appropriate spatial areas over which the factors are defined because the value of each factor varies across the U.S.

- Components of the form **Appropriate spatial areas, in terms of defined "ecoregions," are presented on the next 2 pages, followed by discussion of each of the components of the form, as listed below . . .*
  - *AAI : calculated potential ANC: relates to target ANC
    - ANC is the most commonly used indicator of acidification
  - F_1: natural ability of an ecosystem to neutralize nitrogen deposition
    - Based on factors in well-accepted critical loads models including, base cation weathering, hydrologic flux, N uptake by the ecosystem
  - F_2: reduced nitrogen (ammonia gas and ammonium ion) deposition
    - Based on CMAQ
  - F_3, F_4: factors that convert measured NOy and SOx in the ambient air to NOy and SOx deposition
    - Based on CMAQ

NO_X/SO_X – **POTENTIAL** Form: Spatial Application

- Omernik Ecoregion III classification scheme (developed in the 1980s by EPA) divides the U.S. into ecologically relevant regions (84 regions cover the continental U.S.)
  - Classification is based on common vegetation, geology, soils, and hydrological characteristics – all impact the components of the form
  - Has the additional benefit of providing an appropriate structure for potential future secondary standards to address other deposition-related effects



Source: Staff Policy Assessment, 2011

NO_X/SO_X – **POTENTIAL** Level & Interpretation

POTENTIAL LEVEL

- EPA staff conclude that consideration should be given to a range of values from 20 to 75 µeq/L, which would link back to ambient air concentrations through the AAI
  - This range affords protection from long-term, chronic aquatic acidification
  - Upper part of range affords:
    - Added protection for episodic acidification (e.g., spring snowmelt)
    - Shorter time frame for some water bodies to reach a target ANC
  - Upper end of range is a reasonable value since potential for additional protection at higher values is substantially more uncertain
  - Lower end of range is a reasonable value so as to protect against chronic effects that have been characterized as severe at lower ANC values

$$\text{Aquatic Acidification Index AAI} = F_1 - F_2 - F_3\,[NOy] - F_4\,[SOx]$$

POTENTIAL INTERPRETATION

- **Standard would be met at a monitoring site** when measured values of NOy and SOx are such that the calculated value of the AAI, averaged over 3-5 years, is greater than or equal to the level of the standard, when using the ecoregion-specific factors F1- F4

- **Protection afforded** by such a standard is based on the **combination of the level and the percentile value** used to define the representative water body within a region for the purpose of calculating the term F1, in conjunction with all the other elements of the standard